

Bayesian data analysis

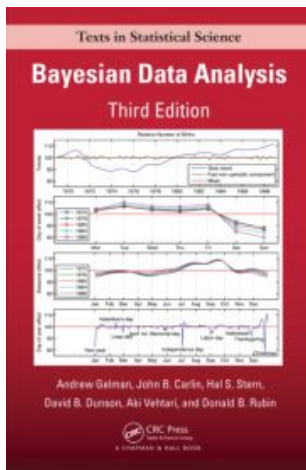
Seminar Overview

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July 7, 2021

Bayesian data analysis

- Book: Gelman, Carlin, Stern, Dunson, Vehtari & Rubin: Bayesian Data Analysis, Third Edition. (online pdf available)



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Example analyses

- Treatment/control
 - randomize patients to treatment or control
 - is the treatment effective?

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- Treatment/control
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 - is the treatment effective?
- Continuous valued treatment
 - randomize patients with different dosages
 - which dosage is sufficient without too many side effects?
- Different effects for different patients?
 - Is the treatment effect different for male/female, child/adult, light/heavy, ...

Bayesian data analysis

Computer exercises

- Foundations
- Difference between binomials
- Difference between normals
- GLM + Metropolis + convergence diagnostics
- GLM + Stan/brms
- Hierarchical linear models + Stan/brms

- Exercises (some have two weeks time)
 - R (Python) simulation exercises
 - Stan probabilistic programming exercises (via R (Python))
- Related R (Python) demos available
- Students have to grade 3 other exercises (peer grading)

Stan is a probabilistic programming framework and ecosystem

40+ developers, 100+ contributors, 100K+ users

R, Python, Julia, Scala, Stata, Matlab, command line interfaces

More than 100 R packages using Stan



mc-stan.org

- Project work in groups of 1–3
 - combines all the pieces learned in one project work
 - R or Python notebook report
 - project report peer graded
 - oral presentation graded by us
- Registration:
 - prerequisites: distributions, linear model, R
 - up to 40 participants (41+ go to waitlist)
 - see https://www.statistik.tu-dortmund.de/stat_sowi_lehre.html and follow the link to the registration form
 - in early October: Kick-off meeting